Transportation for Communities
Advancing Projects through Partnerships

Case Study

CALTRANS:

CORRIDOR SYSTEM MANAGEMENT PLAN

Using Performance Measures to Conduct Analysis and Make Decisions

SHRP 2
STRATEGIC HIGHWAY RESEARCH PROGRAM
Accelerating solutions for highway safety, renewal, reliability, and capacity

TRANSPORTATION RESEARCH BOARD
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The Transportation for Communities website provides a systematic approach for reaching collaborative decisions about adding highway capacity that enhance the environment, the economy, and the community and improve transportation. It identifies key decision points in four phases of transportation decision making: long-range transportation planning, corridor planning, programming, and environmental review and permitting.

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OVERVIEW

Project Overview

In California, corridor system management plans (CSMPs) are designed to focus transportation planning efforts on the effective and efficient use of all facilities within an urban corridor by promoting systematic management strategies that optimize the current freeway system. Corridors include a roadway connecting two points as well as the major parallel arterials and modal systems that operate on or within the broader area.

The concept behind the development of CSMPs came from the desire to focus on the total transportation system and the recognition that the best or most needed projects were not always being selected and funded. Ideally, the CSMP will succeed where other selection processes have failed because the backbone of the CSMP stems from a core set of performance measurements that create a consistent basis from which to conduct the analysis and make decisions.

Caltrans's goal was to use CSMPs to create comprehensive corridor management strategies that bring together the planning efforts of Caltrans headquarters and district staff, local metropolitan planning organizations (MPOs), county congestion management agencies (CMAs), local jurisdictions, and the California Transportation Commission (CTC). Collectively, these transportation planning agencies would bring together their resources and data to evaluate a corridor on the basis of agreed-on performance measures. The performance measures would provide an analytical framework that would enable a consistent assessment of existing conditions and traffic projections within the corridor. The CSMPs would act as a guide for implementation of system management and performance measurement. Overall, the CSMPs would provide one unified concept for managing, operating, improving, and preserving a corridor across all modes and jurisdictions for highest productivity, mobility, reliability, accessibility, safety, and preservation outcomes. The process used to develop the CSMP is summarized in Figure 1.

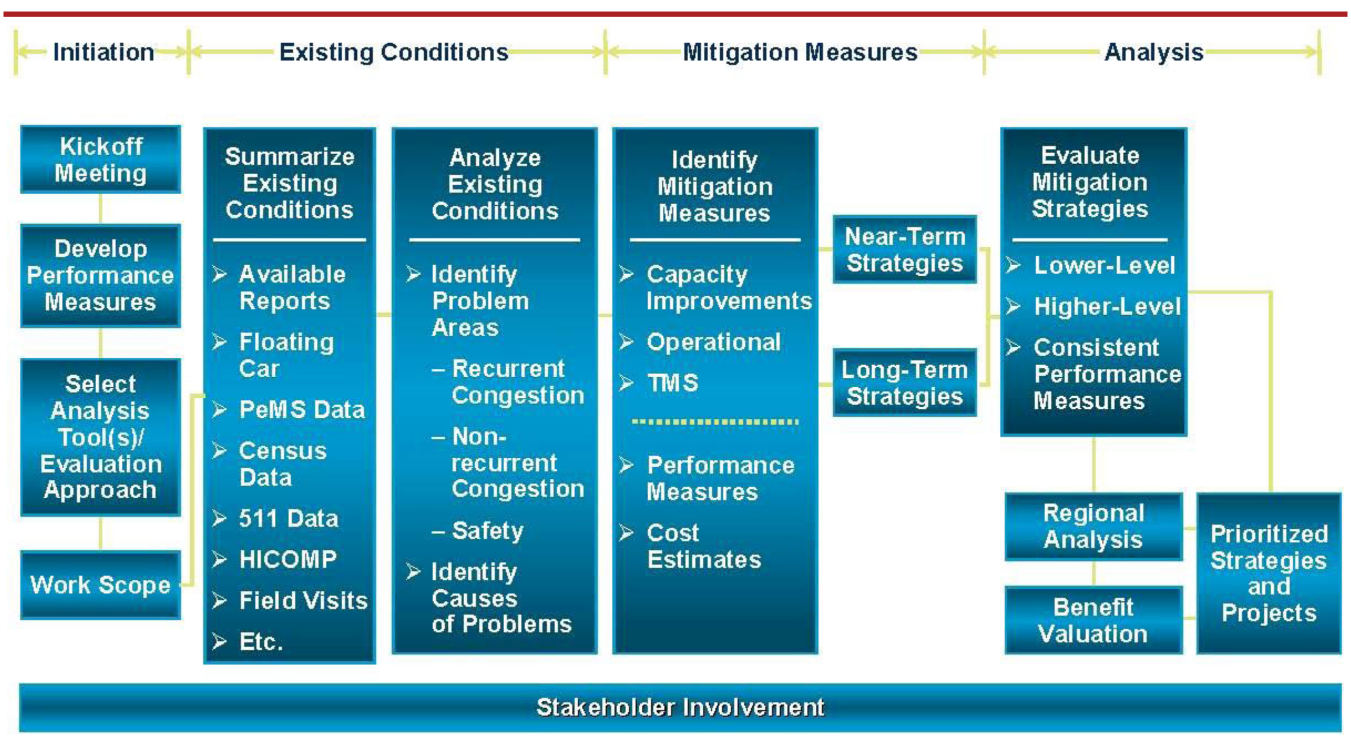

Figure 1. Overview of the corridor system management plan process (*1*).

Courtesy Metropolitan Transportation Commission.

Screening Process Overview

The first CSMP undertaken by Caltrans was the I-880 corridor in Alameda County, California, located in the San Francisco Bay Area. This corridor was selected on the basis of the extensive amount of data available for it and its high level of congestion. The Metropolitan Transportation Commission (MTC) of the Bay Area as well as the Alameda CMA and the local jurisdictions were heavily involved with both Caltrans headquarters staff and District 4 staff in the development of the CSMP. Since the successful implementation of this project, Caltrans has rolled out CSMPs for an additional 26 corridors throughout the state. However, the bulk of this case study summary of CSMPs in California centers on the experience in the I-880 corridor in Alameda County.

Development of the CSMP for the I-880 corridor focused on system management and all of its components. This is best represented in Figure 2, which illustrates the GoCalifornia plan, the transportation component of California's Strategic Growth Plan.

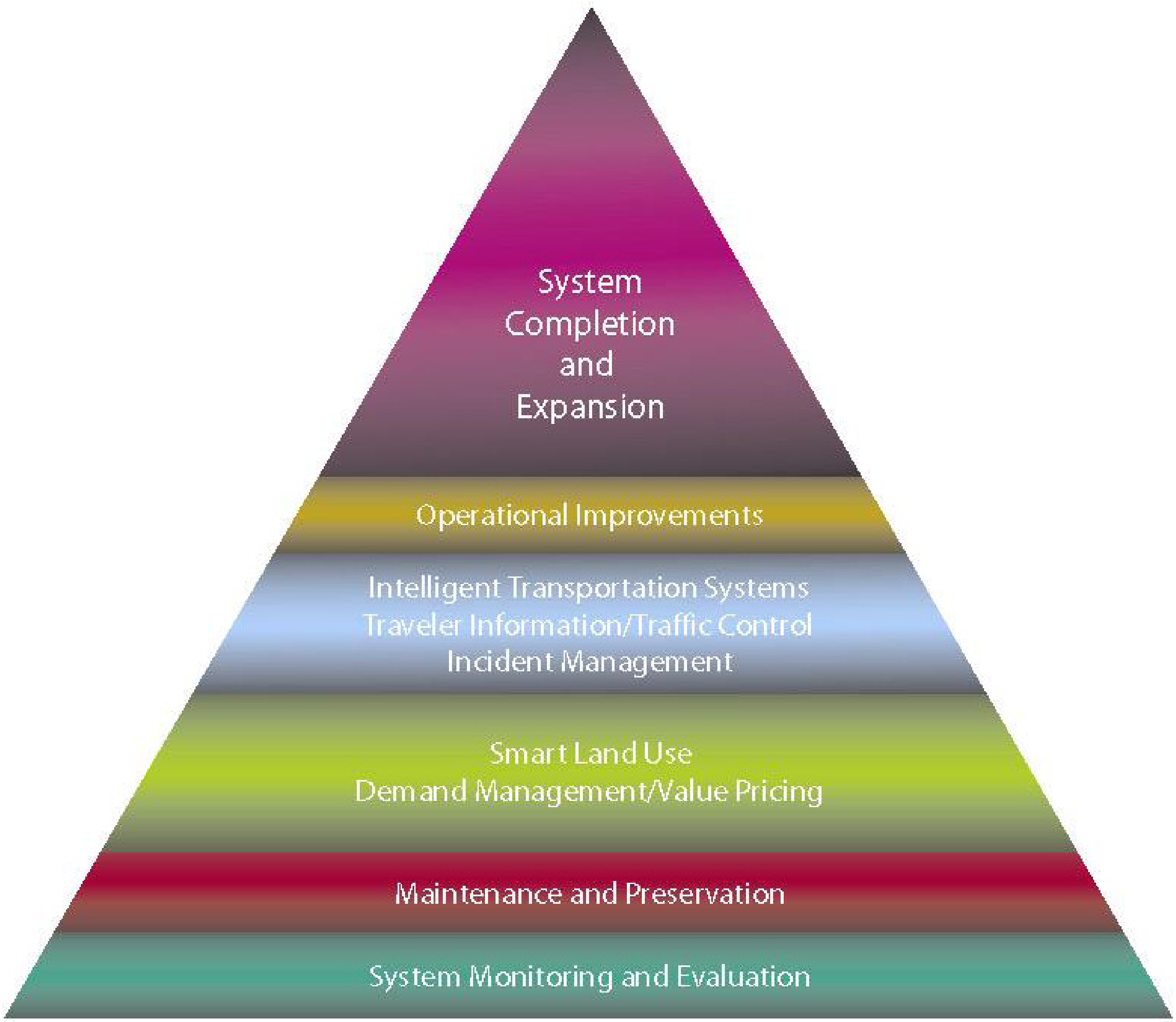

Figure 2. GoCalifornia growth plan.

Source: Caltrans.

Development of the CSMP for the I-880 corridor involved the following steps:

- Initiating the study. An analysis team established communication channels, protocols, and data and information sources; discussed the scope of work, schedule, and budget; and obtained a thorough understanding of the goals for the study. This included defining the corridor limits and width and describing the corridor function.
- Setting performance measures. The primary objective of the performance measures was to provide a sound technical basis for describing traffic performance on the corridor. In addition, agreeing not only on the performance measures but also on the source of the data allowed the project team to work together with the same tools to evaluate corridor performance. The project team used performance measures that were mostly developed by Caltrans operations staff over years of experience with other projects and analysis. However, the entire project team evaluated and decided on which performance measures were relevant and needed for the I-880 corridor.
- Analyzing existing conditions. The analysis team then collected and analyzed all information necessary to understand existing traffic conditions and to identify specific causes of problems. An inventory of the corridor was completed and included a description of the route type and current operational elements such as remote changeable message signs. Additionally, base data on traffic volume and type were gathered, including information on current annual average daily traffic (AADT), peak-hour AADT, 10- and 20-year AADT forecasts, and the number of five-axle trucks.

  The data were then analyzed using the performance measures to determine the current corridor performance. Measures evaluated included the current level of service, travel time and variability, and accident history. Recurring delays caused by signal controls and bottlenecks resulting from changes in route configuration were also described and quantified to the extent possible. Also documented and described were corridor operating procedures, signal control operations, and current maintenance and preservation practices (e.g., shoulder grading).
- Describing future corridor performance. After the baseline information was established, 10- and 20-year forecasts of corridor performance were described. These included scenarios in which the planned, programmed, and other improvements were made. This allowed the project team to evaluate each improvement or change and how the changes would reflect on the corridor performance measures.

  To aid in the assessment of future performance of the corridor, microsimulation models were used to analyze traffic flows, providing a reasonable representation of queues and congestion, evaluating bottlenecks, analyzing operational projects, and quantifying benefits resulting from operational strategies.
- Developing mitigation strategies and projects. Once the data and performance measures had been reviewed, the project team was able to evaluate viable congestion relief measures, which were developed to maximize efficient use of the existing capacity within the corridor by using more traditional capital improvements. This included strategies to enhance the integration of the freeway with parallel arterials. The proposed measures were then segregated into short-term and long-term implementation timelines. The analysis team then identified strategies to mitigate congestion and began to develop planning-level cost estimates.
- Analyzing strategies and projects. Finally, the analysis team evaluated the proposed congestion mitigation strategies and projects, making use of past and current evaluations of the corridor where appropriate and conducting new analyses where needed. This helped the project team bring the corridor to a higher facility standard where applicable and to improve current operations.

KEY ASPECTS OF THE SCREENING PROCESS

Scope

The CSMPs were designed to be a part of the corridor planning phase. MTC used the analysis and recommendations from the CSMP as it developed and updated its Transportation Improvement Program (TIP). The result was that MTC was able to put forward improvements for the corridor that will improve the overall corridor efficiency as outlined by CSMP process.

The initial CSMP for I-880 in Alameda County focused only on transportation performance based on the performance measures that were derived from traditional travel indicators, such as level of service. However, it was the goal of all parties involved to eventually integrate the CSMPs with other planning activities, such as land use and environmental resources.

The CSMP for I-880 resulted in the creation of strategies to enhance the integration of the freeway with parallel arterials and transit. The proposed strategies were then segregated into short-term and long-term implementation timelines. The CSMP was used to analyze and choose congestion management strategies and projects on the basis of established performance measures.

Communications

Agency Involvement

The CSMP process is designed to be a collaborative one among all agencies involved in moving people and goods along a corridor. For the I-880 corridor, the participating agencies included Caltrans headquarters, Caltrans District 4, MTC, CMA, the Bay Area Rapid Transit District, and the local jurisdictions. Both Caltrans and MTC led the CSMP process for the I-880 corridor. They led the efforts to organize and develop the project, scope, and framework. In addition, they brought all participants together to agree to and develop the CSMP process, because the collaboration of all the agencies was essential to its success. This came out of a series of steering committee meetings and policy development meetings. CMA is in the process of completing the modeling aspects of the CSMP. The data used in the analysis process came from sources that Caltrans, MTC, and CMA already had in place.

Each participant in the CSMP process was required to sign a charter committing to improving transportation along the corridor and working together to attain the benchmarks set on the basis of the agreed-on performance measures. This step helped formalize each organization's commitment and facilitated the use of feedback from the participating organizations to help refine the study elements and address agency concerns as applicable.

Public Involvement

The CSMP process was designed to improve efficiency of a corridor on the basis of performance measures. This cross-agency, data-driven process was geared more for identifying problems and solutions at an administrative level prior to citizen-focused efforts that typically take place later during the transportation planning process. Although the public was not involved in the development of the CSMP, it will ultimately have a voice concerning the outcomes of the CSMP process when the results of the analysis are presented to the public for discussion during the development of the TIP.

Technology

Three tools were used to calculate mobility: probe vehicles, PeMS (Performance Measurement System), and 511. The statewide Highway Congestion Monitoring Program (HICOMP) provided a comprehensive data report on congestion levels for heavily traveled freeways throughout California. The data were gathered through probe vehicles, which make trips over predetermined segments and measure the time needed to complete a route. HICOMP also uses loop detectors to gather data for the comprehensive reports. Valuable data sets for the I-880 corridor were derived from these HICOMP reports.

PeMS is a web-based tool designed by the University of California, Berkeley, to host, process, retrieve, and analyze road traffic condition information. PeMS receives data from California freeway traffic detectors, as well as incident-related data from the California Highway Patrol and Caltrans. These data—including vehicle miles traveled and ADDT, from real-time and historic freeway detector data—were entered into some of the performance measures used in the CSMP process.

The 511 phone and web system was developed by MTC to give commuters access to real-time travel time information. It is meant to assist commuters in planning their trips around accidents and bottlenecks. Over the years, MTC had archived these data, enabling their use to study historic travel patterns and issues along the I-880 corridor.

Using the data resources for the I-880 corridor, Caltrans and MTC jointly developed performance measures, which were then taken to the local agencies for approval. A subregional model, or a model designed more to accommodate a smaller area, was originally developed by MTC, and then the congestion management agency (CMA) was allowed to develop a consistent subregional model using the same inputs and model structure. A microsimulation model was developed with funds from the Caltrans district office by a consultant. Microsimulation models use the dynamic variables of car following and lane changing to simulate the movement of individual vehicles. These tools were used to help identify deficiencies and highlight various alternatives. Additionally, cost-benefit tools were used to help identify the most cost-effective measures. The travel model outputs helped show how different alternatives affect the performance measures.

Metrics and Data

The CSMP was developed from a series of performance measures that focus on three key areas: mobility, reliability, and safety. The mobility performance measures were based on travel time and delay. The reliability performance measures captured the relative predictability of the public's travel time and how much mobility varies from day to day. The safety performance measures were generally based on the number and rates of accidents.

Data for the performance measures were obtained from PeMS, 511, and the Caltrans Traffic Accident Surveillance and Analysis System (TASAS). PeMS is a real-time system that automatically computes travel times using speed data from freeway indicators. The 511 phone and web system is also a real-time system operated by MTC that obtains data by reading the time and location of Fastrak transponders at locations along the freeway. TASAS is a traffic records system containing an accident database linked to a highway database. These tools were used to gather the metrics along the I-880 corridor and were essential to the development of the CSMP. Although some of these measurement tools are specific to California and the San Francisco Bay region, the data they collect are commonly collected by state transportation departments and local MPOs through various means along heavily traveled corridors.

LESSONS LEARNED

Success Factors

In its first implementation in Alameda County, the CSMP process was successful in getting all parties involved in transportation decision making to work together to develop a plan for the I-880 corridor. This effort resulted in a signed commitment from each party to work collaboratively to implement changes that will help the corridor meet the agreed-on performance measures.

Key Innovations

Developing a set of performance measures on which all participating agencies could agree was essential for creating a common baseline for measurement and decision making throughout the CSMP process.

Bringing together all agencies and jurisdictions involved in moving people along the corridor that not only considered the immediate highway, but the arterials and public transit within the corridor as well, helped ensure that the big picture would be considered in the decision-making process.

Transportation improvement decisions were made on the basis of how the improvements were expected to affect corridor performance. This assessment was based on the use of the performance measures and modeling techniques.

BARRIERS AND SOLUTIONS

Analytical

The ability to complete the CSMP for the I-880 corridor in Alameda County was dependent on a considerable amount of data from multiple sources. In the case of the I-880 corridor, this level of data was already being collected by a combination of sources that included Caltrans, MTC, and CMA. However, different performance measures could be used to create a corridor plan relevant to the available data and situation at hand.

The CSMP did not take into account impacts to the human or natural environment, although bringing this information into the analysis would have provided a broader analysis of impacts. Project leaders were unable to address these impacts because they were unable to find a consistent data source and were not able to develop meaningful performance measures from the available data. Currently, MTC is working on identifying reliable data and beneficial performance measures that would strengthen the CSMP process.

Institutional

The CSMP process will apply only to large urban areas that have active traffic operations initiatives. Rural areas that have less traffic operations data would not be able to use the CSMP effectively, and thus CSMP proponents did not attempt to make this a process that could be used by all areas regardless of size.

Because of the technical nature of the data components of the performance measures on which the CSMP is based, many of the local jurisdictions and elected officials had to go through a learning process to develop an understanding of traffic operations strategies and the effectiveness of traffic operations measures. This problem was circumvented by a series of workshops that Caltrans and MTC sponsored that provided the requisite technical background for the participants.

RECOMMENDATIONS

The CSMP process is an excellent medium for bringing together the organizations responsible for making transportation decisions. The CSMP focuses the energy and efforts of these organizations and, with the agreed-on performance measures, creates a common decision-making tool. The results and recommendations of the CSMP provide the decision makers with the information required to make educated decisions regarding transportation funding.

REFERENCE

1. *Freeway Performance Initiative Traffic Analysis: Performance and Analysis Framework*. Metropolitan Transportation Commission, Oakland, Calif., 2007.

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